I, Alexander Zinchuk, residing at 340 East 74th Street, New York, New York 10021 declare that:

I am proficient in the English and German languages.

I have carefully made the attached translation from the International Preliminary Examination Report, issued in International Application No. PCT/EP03/00237 written in the German language;

The attached translation is a true and correct English version of such original, to the best of my knowledge and belief.

I further declare that all statements made herein on my own knowledge are true and that all statements made on the information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both under Section 1001 of Title 18 of the *United States Code* and that such willful false statements may jeopardize the validity of the application or any registration resulting therefrom.

Alexander Zinchuk

Alexander Zinchuk

Dated: June 16, 2004

DT-6832 **PCT/EP03/00237**

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

I. Basis of the Report

This report has been drawn on the basis of (substitute sheets which have been furnished to the receiving Office in response to invitation under Article 14 are referred in this report as "originally filed" and are not annexed to the report since they do not contain amendments):

Description, pages

1-15	as originally filed

Claims, Nos.

23, 24	as originally filed
1-22	submitted on April 9, 2004 with a letter of April 6, 2004

Drawings, Sheet

1/4-4/4	as originally filed

V. Reasoned Statement under Article 35(2) with Regard to Novelty, Inventive Step and Industrial Applicability; citations and explanation supporting such statement.

1. Statement

Novelty	Claims 1-22	Yes
Inventive Step	Claims 1-22	Yes
Industrial Applicability	Claims 1-22	Yes

2. Citation and Explanations

See attachment

ATTACHMENT

To Paragraph V5

Reasoned Statement under Article 35(2) with Regard to Novelty, Inventive Step and Industrial Applicability; citations and explanation supporting such statement.

The following documents are referred to:

D1: EP-A-0866138

D2: FR-A-2,681,417

The changes introduced with the letter of April 6, 2004 contain no features which, contrary to Article 34(2)(c)PCT, go beyond the disclosure in the international application as filed.

Novelty and Industrial Applicability

The Document D1 represents the closest prior art with regard to claim 1 and discloses (see column 4, line 35-column 5, line 40) a method of pyrometallurgical treatment of metals. With this method, an oxygen-containing gas is fed to an injection device and is accelerated to a supersonic speed (column 4, line 14, (150-915 m/sec). With an annular slot nozzle, the gas jet is surrounded with a flame

envelope which has a speed that is smaller (column 6, line 26, 15-150 m/see) than that of the central gas jet.

The present invention according to claim 1 (method) distinguishes from the above-discussed prior art by following technical features:

the speed of the flame envelope is noticeably lower than that of the central gases, and the gases for forming the flame envelope are not preheated.

The technical effect consists in that maximization of the length and the penetration depth of the gas jet in the slag layer, which is located above the metal melt, for producing an intensive mixing and movement is achieved.

The technical object, maximization of the length and penetration depth of the gas jet, is achieved by the applicant by providing a device (claim 15) which consists of an oxygen injector with an inner wall and Laval nozzle and which is surrounded by a hot gas union with, in the discussed embodiment, a ring slot nozzle.

With this device the method of claim 1 is effected.

Neither the method (claim 1) nor the device (claim 15) are known from the foregoing prior art. Also, the applicant could not possibly derive the inventive features from the prior art.

Subclaims 2-14 and 16-22 recite particularities of the method/device according to claim 1 or 15 and, therefore, also relate to inventive activity.

Industrial applicability

The invention, method and device can be used in the pyrometallurgical treatment of metals, metal melts, and/or slags.

CLAIMS:

1. Method of pyrometallurgical treatment of metals, metal melts, and/or slags in a metallurgical installation or a melting vessel, in particular for blowing up or in oxygen-rich gases in electrical are furnace with an injection device with accelerates oxygen-containing gases (6) to a supersonic speed, with an ejected, therefrom, high-velocity jet (6') being protected by a gaseous envelope completely enveloping same for using the same for pyrometallurgical treatment,

characterized in that

the gaseous envelope is formed of a hot gas (5) that is so fed to the central high-velocity jet (6') that relative speed and pulse exchange between the central high-velocity jet (6') and the hot gas enveloping jet (5') is minimized (quasi isokinetic feeding),

the oxygen-rich gas (6) is accelerated in an injection device (1) in a nozzle system (preferably in Laval form) to a speed from 300 to 800 m/sec, and the hot gas (5) is accelerated to approximately same speed with an annular slot

nozzle (4) of the injection device (1), with the hot gas (5) having a temperature from 300 to 1,800°C upon entering the injection device.

2. A method according claim 1,

characterized in that

the hot gas (5) becomes available due to an external reaction of fuel (8, 8') with an oxidant and/or as a result of recirculation of hot gases from the metallurgical installation.

3. A method according to claim 1 or 2,

characterized in that

for producing of the hot gas, a preheated oxidant with an oxygen content from 10 to 100% by volume, preferably, 21% by volume is used.

4. A method according to claim 1 or 3,

characterized in that

the preheating of the oxidant is integrated in a cooling system of the injection device (1) and/or forms an essential component thereof.

5. A method according to claim 1, 2, 3, or 4,

characterized in that

adjustment of hot gas temperature in front of the injection device (1) is effected by controlling power of a hot gas generator (20) and/or by adding water (19) to the hot gas before its acceleration.

6. A method according to one or more of claims 1 through 5,

characterized in that

an oxygen content of the oxygen-rich gas (6) amounts from 10 to 100% by volume, preferably, more than 95% by volume.

7. A method according to one or more of claims 1 through 6,

characterized in that

particle-shaped solid materials and/or liquid material (8), if needed, is fed to the central oxygen jet (6), wherein feeding of these substances is effected with an additive injector (15) coaxially arranged in the oxygen injector (10) in the same direction and before an end of the acceleration process.

8. A method according to claim 7,

characterized in that

the particle-shaped solid material contains carbon (e.g., coal or coke dust), alkali and/or alkali earth metals (e.g., limestone, unhydrate lime, or dolomite, and the fluid material (8') contain carbon (e.g., natural gas, coke gas, converter gas, heating oil), respectively, in high concentration (more than 30% by weight).

9. A method according to one or more claims 1 through 8,

characterized in that

the oxygen injector (10) operates alternatively with a technical oxygen and air, wherein a switch from oxygen supply to air supply and back is effected by using (31), and for air supply, an oxidant source or another source, e.g., a compressed air network (22) or a blower (21) is used.

10. A method according to one or more of claims 1 through 9,

characterized in that

the control of the operation of the hot gas generator (20), e.g., λ – control of combustion, the control of the hot gas temperature, the control of a cooling exit temperature, etc. is effected by an automation unit (R1).

11. A method according to one or more of claims 1 through 10,

characterized in that

the control of the operation of the oxygen injector (10), e.g., volume flow, admittance pressure, etc. is effected by an automation unit (R2).

12. A method according to one or more claims 1 through 11,

characterized in that

the control of the operation of the additive injector (20), e.g., mass flow admittance pressure, etc., is effected by a further automation unit (R3).

13. A method according to one or more of claims 1 through 12,

characterized in that

more than one injector devices (1), preferably from two to four, are provided on the metallurgical installation.

14. A method according to one or more of claims 1 through 13,

characterized in that

coordination of operation of the automation devices (R1, R2, R3) is effected with an overriding central automation unit (R) that stands in data exchange with a process control system (PCS) of the metallurgical installation, or is self-sufficient, wherein the data exchange is effected with corresponding automation units of the injection devices (1).

15. An injection device (1) for pyrometallurgical treatment of metals, metal melts, and or slags in a metallurgical installation or a melting vessel, in particular for blowing up or in oxygen-rich gases and/or carbon-containing material in an electric arc furnace, wherein the injection device accelerates oxygen-containing gases, (6) to a supersonic speed, with an ejected therefrom, high-velocity jet (6') being protected by a gaseous envelope completely enveloping same for using the same for pyrometallurgical treatment, in particular for effecting the method according to one or more of preceding claims,

characterized by

a modular construction of separate subassemblies consisting of an oxygen injector (10) with an inner wall (11) and a Laval nozzle (13) for accelerating an oxygen-rich gas (6), which is surrounded by a hot gas union (2) in an outlet region of which is arranged an annular slot nozzle (4) or similar constructed means with a comparable action for passing and acceleration of a hot gas (5).

16. A method according to claim 15,

characterized in that

the oxygen injector (10) is axially displaceable and wherein an outlet plane (5) of the oxygen injector (10) in each position thereof is located between planes (E3) and (E4) of the hot gas union (2).

17. An injection device (1) according to claim 15 or 16,

characterized in that

outlet regions of the gases are extended by a common hot gas sleeve (3).

18. An injection device (1) according to claim 16, 16, or 17,

characterized in that

in the entrance region of the hot gas union (2), water spray means is arranged.

19. An injection device (1) according to one or more of claims 15 through 18,

characterized in that

within the central oxygen injector (10), an additive injector in form of an additional coaxial tube with an outlet opening (16), which is formed as a mouth or nozzle, is arranged.

20. An injection device (1) according to claim 19,

characterized in that

the outlet opening (16) of the additive injector (15) is formed of a wear-resistant material and is replaceable.

21. An injection device (1) according to claim 19 or 20,

characterized in that

the additive injector (15) is axially displaceable and is positioned with its outlet plane (B) between planes (E1) and (E2) of an oxygen injector (10).

22. An injection device (1) according to one or more of claims 15 through 21,

characterized in that

separate subassemblies of the injector device (1) are mounted on a common support arranged in a wall of the metallurgical installation.